VII. *Obſervations on ſome remarkable Strata of Flint in a Chalk-pit in the Iſle of Wight, in a Letter from Sir Henry Charles Englefield, Bart. F.R.S. to John Latham, M.D. F.R.S. and L.S.*

Read April 1, 1800.

DEAR SIR,

AS you conſidered the ſpecimens of flint which I ſhowed you worthy of the notice of the Linnean Society, I tranſmit them to you, together with ſuch an account of the ſituation in which I found them, as may perhaps lead to a gueſs of the cauſes of their preſent very extraordinary condition, and will at leaſt ſerve as a guide to thoſe who may wiſh at a future time to inſpect the curious pit where I found them.

Before I enter on the particular deſcription of that ſpot I cannot help ſaying a few words on the lithology of the iſland in general, which has not, that I know of, been deſcribed, as it highly deſerves, by any naturaliſt. Had I been equal to ſuch a taſk opportunities of obſervation were wanting, and the phænomenon which I am about to deſcribe was diſcovered by me ſo ſhort a time before I quitted the iſland that I had not time to inſpect more than one pit beſides that in which I firſt obſerved it.

The Iſle of Wight, which is nearly of a rhomboidal form, lies with reſpect to its four angles, almoſt abſolutely in the four points of the compaſs. It is divided into two very nearly equal parts by a range of chalk hills, whoſe general direction is due eaſt and weſt. Theſe hills do not, however, lie in a ſtraight line, nor are they at all

of equal breadth or height throughout their extent. At Bembridge, where they form the eaſtern point of the iſland, they riſe abruptly from the ſea to a height of about 400 feet; and, bending a little to the northward, they continue of nearly the ſame elevation and a very narrow breadth, till they terminate at the valley through which the Medina runs. To the weſt of the Medina the range grows conſiderably wider, and is ſubdivided into ſeveral ſubordinate vallies. This additional breadth gives the ſouthern limit a great curvature to the ſouth, while the northern line remains nearly ſtraight. Their elevation increaſes much, and at Mottiſton is 700 feet. The acute and perpendicular promontory in which they terminate to the weſt, well known by the name of the needles, is nearly as high as Mottiſton. Beſides the valley of the Medina this range is ſingularly interrupted by two vallies exactly ſimilar to each other at the two ends of the iſland. Brading Haven renders Yaverland at the eaſt almoſt an iſle, and the Yarmouth inlet cuts off the weſtern end ſo nearly that at high tides it is ſometimes quite inſulated at Freſhwater Gate.

To the north of this range of chalk hills the ſoil is chiefly clay, with a ſuperſtratum, in many parts, of gravel. The clay is interſperſed with many beds of ſtone of different qualities, and which appear to lie in great confuſion. Of theſe ſome are grit with a ſlight admixture of calcareous matter; others have nearly equal parts of ſand and lime, and others are purely calcareous. In the firſt, which are of great hardneſs, very few extraneous bodies appear. In the ſecond are many fine impreſſions of ſhells, while the laſt are almoſt entirely compoſed of moulds of turbinated ſhells ſo as to appear quite honeycombed by them. This ſtone is, however, of great durability, for the walls of Cowes Caſtle, which was built by Henry VIII. and is expoſed to the ſea air from the weſt and north, are as perfect as on the day in which they were built. Below all theſe

ſtrata

ſtrata of ſtone, at Eaſt Cowes, and juſt above a bed of black and ſolid clay, is a ſtratum of ſhells about two feet thick, of which a ſpecimen accompanies this, and which is totally compoſed of theſe ſhells without any admixture or earth whatever. As the ſea makes great inroads here, vaſt heaps of theſe ſhells lie on the beach, and ſeem juſt waſhed up by the waves, inſtead of being torn from their bed in the cliff. They appear nearly in the ſame ſtate as thoſe on the Hampſhire coaſt, which have long been famous among naturaliſts. In the bed at Eaſt Cowes there appears however no variety; for I could ſee no ſpecies but what are here exhibited.

Whatever confuſion in the ſtrata appears to the north of the chalk range, or in that range itſelf, diſappears to the ſouth of it, where the ſtrata are nearly in a horizontal poſition, and ſingularly regular and undiſturbed. The ſea coaſt from Bembridge ſouth to the Needles, except in the ſmall extent of Sandown Marſh, is every where higher than the immediately contiguous land of the iſland, and to the ſouth-eaſt riſes into a vaſt range of hills running from Dunnoſe weſt to St. Catherine's. The ſubſtratum of theſe hills ſeems every where to be clay lying in ſtrata of different colour and purity. The loweſt is black and very hard; approaching to ſhale. Above this ſome ſtrata have a great mixture of ſand, and take the appearance of a ſoft ſtone breaking into very regular cubical forms. Theſe ſtrata extend over the whole ſouthern part of the iſland, and terminate againſt the chalk range very ſuddenly. Above the clay ſtrata is a bed of ſtone in thin layers, and of very mingled materials, but in general very hard. Great quantities of chert or flint nodules appear in this ſtone. The general thickneſs of the ſtratum is from 150 to 200 feet. Above this the higheſt hills of the range have a ſtratum of chalk, not pure or white as that of the chalk range properly ſo called, nor producing flint ſo black.

The height of Dunnoſe is 800 feet above low water mark. St. Catherine's hill is at leaſt 850. Of the former I had no opportunity of examining accurately the thickneſs of the ſtrata; but at St. Catherine's the ſtrata are as follow:

Chalk	-	250 feet
Stone	-	200 feet or perhaps not quite ſo much.
Clay and ſand		400 feet
		850

This arrangement accounts entirely for the formation of that ſingular coaſt called the Undercliff, which extends from Dunnoſe to St. Catherine's, and is compoſed of the confuſed fragments of the upper ſtratum of rock which have given way and rolled down as the ſubſtratum of clay has been waſhed away by the ſea. In moſt parts the proceſs ſeems nearly at a ſtand; the coaſt being now protected by the fallen rocks; but at St. Catherine's great devaſtation is ſtill taking place. The earth-fall mentioned laſt year was a very ſmall operation of this kind when compared with the relicks of former convulſions.

From this ſhort ſketch of the general poſition of the ſtrata in the iſland, I return to the particular ſubject of the preſent paper.

The chalk pit, which I am about to deſcribe, is ſituated on the northern edge of the chalk range juſt out of the village of Cariſbrook, and about an hundred yards beyond the diviſion of the roads to Yarmouth and Shorwell. The pit is open to the eaſt. The ſtrata of chalk are very regular, from two to five feet in thickneſs, and divided by ſeams of flint from ſix inches to nine inches in depth. The flints are, as uſual, in nodules of different ſizes, from the ſize of the fiſt to twice the ſize of a man's head. The whole dip northward with an inclination of at leaſt 67 degrees. Perpendicular fiſſures run through the whole from north to ſouth, the ſides of which

Linn. Trans. VI. tab. 7. p. 107.

which are nearly as flat and ſmooth as a wall. As theſe fiſſures are followed with convenience in working the pit, an extenſive face was laid open when I ſaw it, and the appearance was as in the annexed ſketch. See TAB. VII. On examining the beds of flint nearly, I was aſtoniſhed to find that every flint, though lying in its place, and retaining perfectly its original ſhape, was more or leſs burſt and ſhattered; ſome few were only ſplit into large pieces, but the greater part were broken into ſmall fragments, and ſome abſolutely reduced to impalpable powder. From one which had ſuffered the moſt the annexed ſpecimen was taken. The powder was ſo very fine that I had conceived it muſt have been mixed with chalk; but, on waſhing it with diluted marine acid, I found that it was purely ſiliceous. Indeed the chalk which ſurrounds theſe flints is uncommonly ſolid, and does not exhibit cracks or marks of any violence except the great fiſſures beforementioned. A ſpecimen of the flint powder after waſhing in the acid is ſent with the other.

I muſt obſerve that I had but imperfect opportunity of inſpecting the flints which lay at a diſtance from the fiſſure; ſuch however as I could ſee in the bed then working appeared to have been leſs ſhattered in proportion as they were more remote from the fiſſure; but all had ſuffered more or leſs.

About 200 yards below this pit, and nearer to Cariſbrook village, the road is in part cut through the chalk, and the beds of flint expoſed by that means exhibit the ſame appearances as thoſe in the pit above.

The chalk pit above Shide Bridge, which is the only one I had an opportunity of examining after my diſcovery of the phænomenon above deſcribed, preſents in ſome degree the ſame appearances, but does not afford ſo good an opportunity of viewing the ſtrata as that at Cariſbrook. The ſtrata did not appear to me to lie ſo regularly